

Potato Texture Analysis

This analysis will evaluate potato hardness with different cooking times by compression using the CTX Texture Analyzer and Kramer shear cell.

Background:

Potato Cell Structure:

- Rigid cell wall made of polysaccharides, with the middle lamella primarily composed of pectic material binding the cells.
- Heating affects the cell wall, causing loss of adhesion, membrane integrity, and turgor pressure.
- Starch grains absorb water, swell, and form a gel, leading to softer tissue.
- Hardness is affected by starch swelling and stability of pectic substances.



Texture Analysis:

- Measures firmness, shear, elasticity, adhesiveness, cohesiveness, chewiness, and gumminess.
- Used for quality control, consumer acceptance, shelf-life studies, and formulation changes.

Equipment:

- CTX Instrument with 100 kg load cell
- Kramer Shear Cell (TA-KSC002) with five blades
- Fixture Base Table (TA-BT-KIT)
- Catchment Tray for extruded product
- Texture Pro CT Software



Test Settings:

- Test Type: Compression
- Speeds: Pre-test, test, and post-test at 1.0 mm/s
- Target Distance: 60 mm
- Trigger Load: 50 g

Procedure:

1. Dice and weigh equal amounts of potatoes to fill 70% of the cell capacity.
2. Attach blades to the probe shaft.
3. Place and align the fixture base table and Kramer shear cell; tighten for stability.
4. Insert the catchment tray under the cell.
5. Remove blades to place the sample, then reattach and align blades.
6. Lower blades to just above the sample.
7. Commence the test.
8. Clean blades and cell between samples.

Observations:

- Load vs. Time Graph (Fig. 1): Shows firmness across different cooking times.
- Load vs. Distance Graph (Fig. 2):
- Maximum force measures sample hardness (higher force = harder sample).
- Area under the curve indicates work done (energy needed to shear the sample).

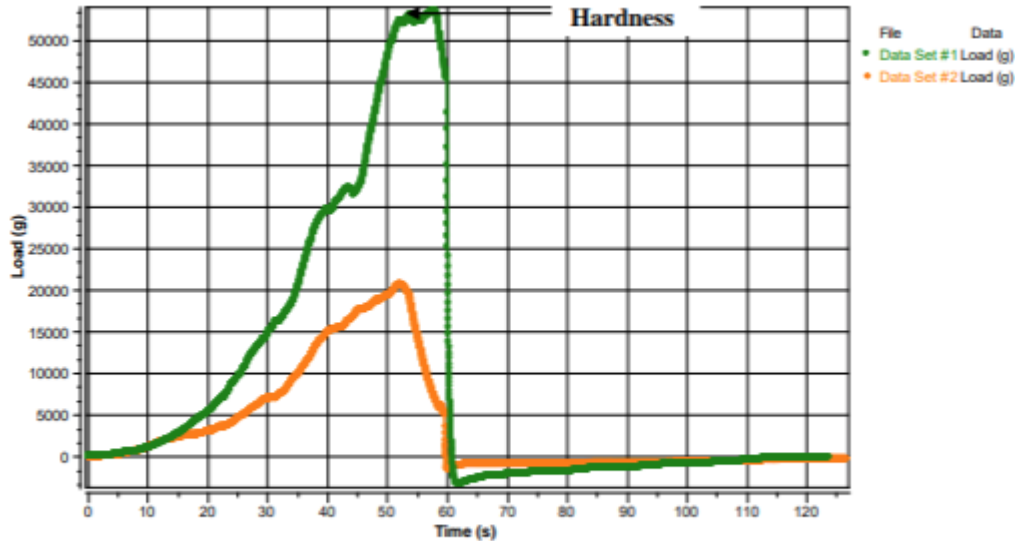


Figure 1

The Load/Time graph for the firmness of potatoes of different cooking times

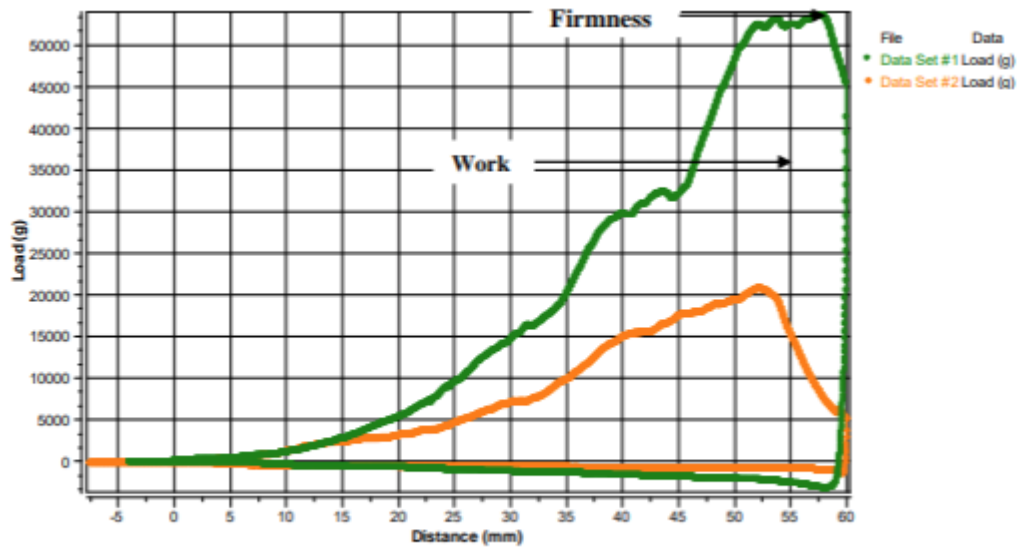


Figure 2
The Load/Distance graph for the firmness of potatoes of two different cooking times

Results:

Cook Time of 2 Minutes:

- Hardness: 53,600 g
- Work Done: 11,774.7 mJ

Cook Time of 8 Minutes:

- Hardness: 20,845 g
- Work Done: 4,858.4 mJ

Discussion:

- Maximum peak force correlates with the biting force needed to shear the potato on the first bite.
- The area under the curve represents the energy required to break internal bonds (Fig. 2).
- Longer cooking times result in softer potatoes with lower hardness and work values.

Conclusion:

- The texture analysis method determines potato hardness and work done based on cooking time, providing insights for quality control and product optimization.